

FIG. 1A (PRIOR ART)

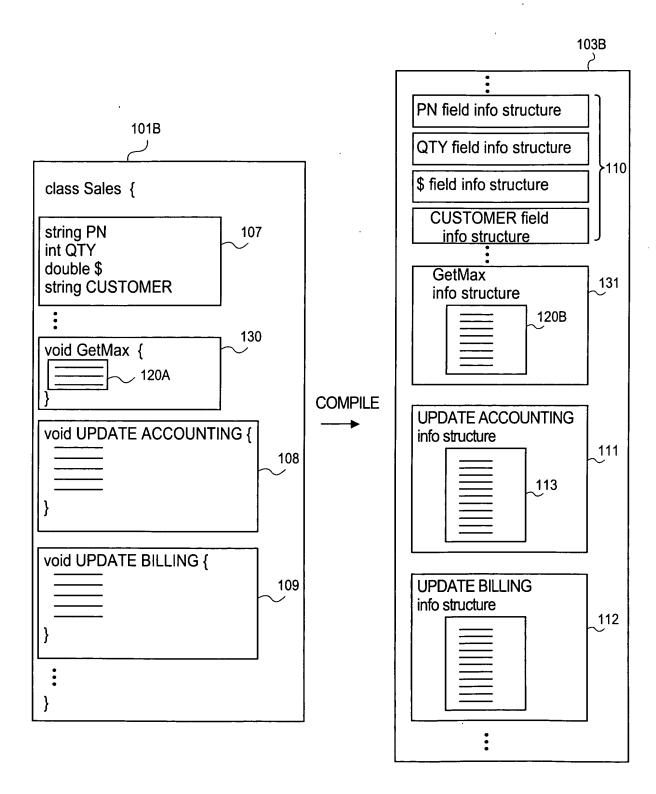


FIG. 1B (PRIOR ART)

"GetMax" "GetMax" source code text: equivalent byte code: 120A 120B 140B iload_Ø 140A if (a > b) { iload_1 141A return a; icmp **COMPILE** } else { iFeq L_Ø 142A return b; iload_Ø 141B ireturn LØ: iload_1 142B ireturn 150 <u>143</u> 141 142

FIG. 1C (PRIOR ART)

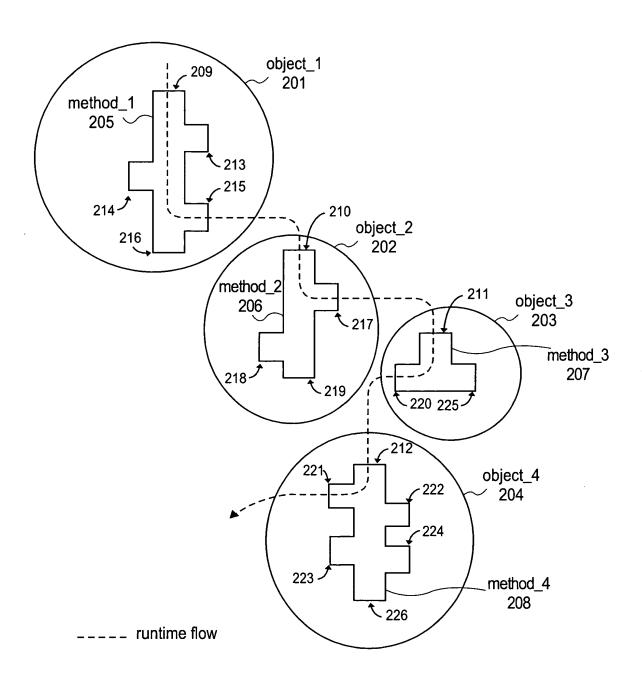
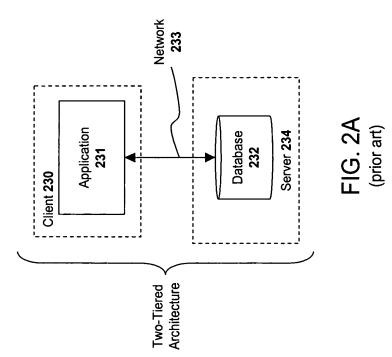
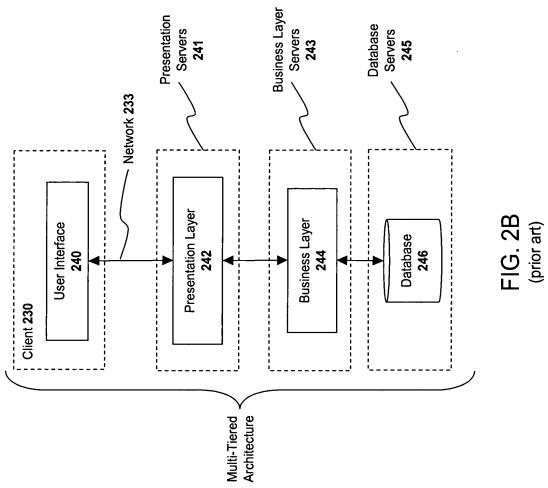
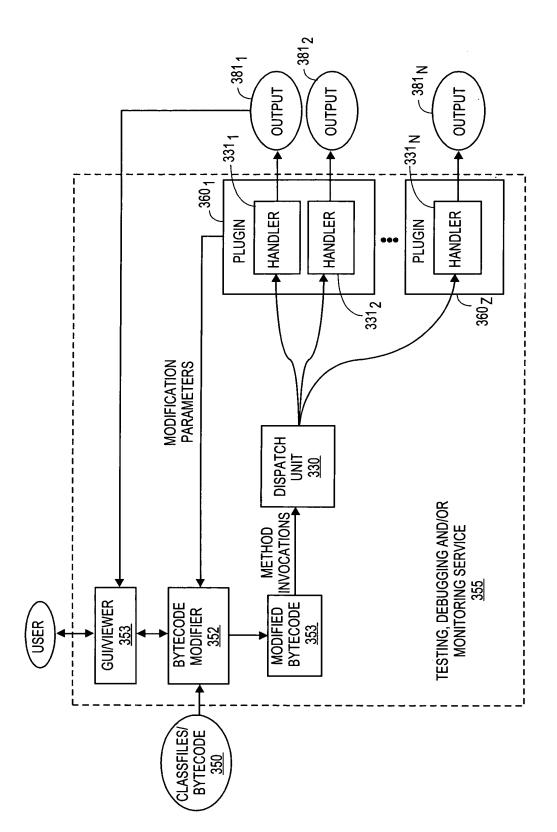


FIG. 1D (PRIOR ART)







<u>FIG. 3</u>

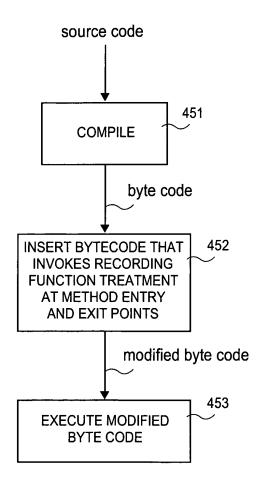
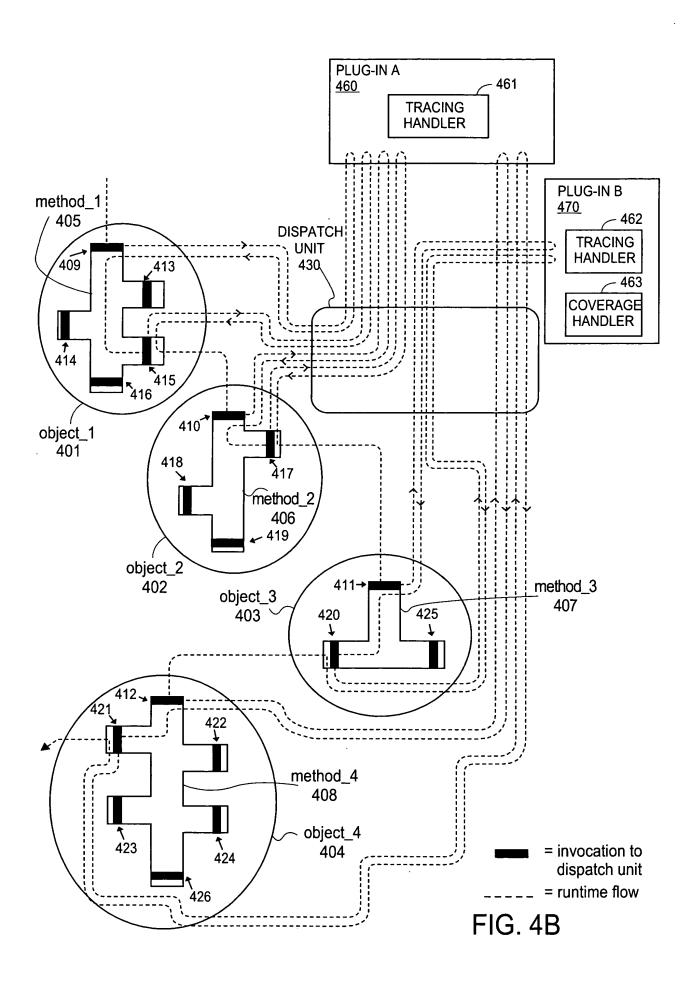
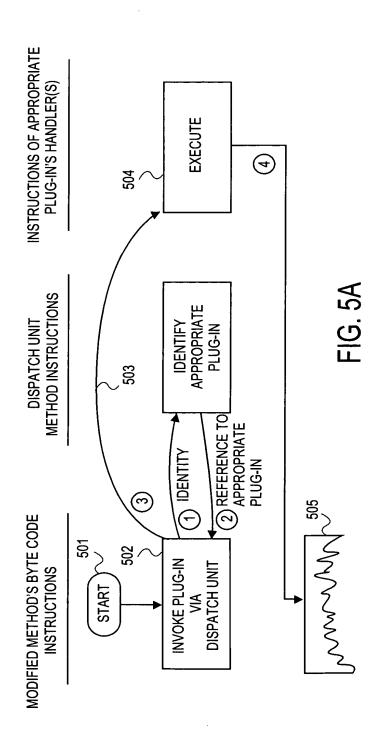
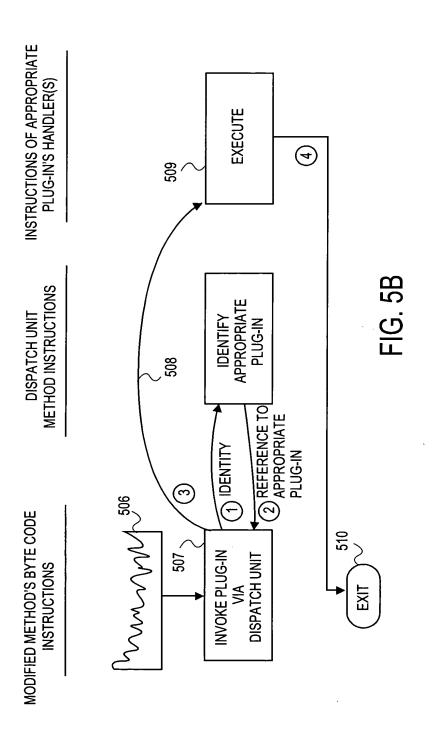
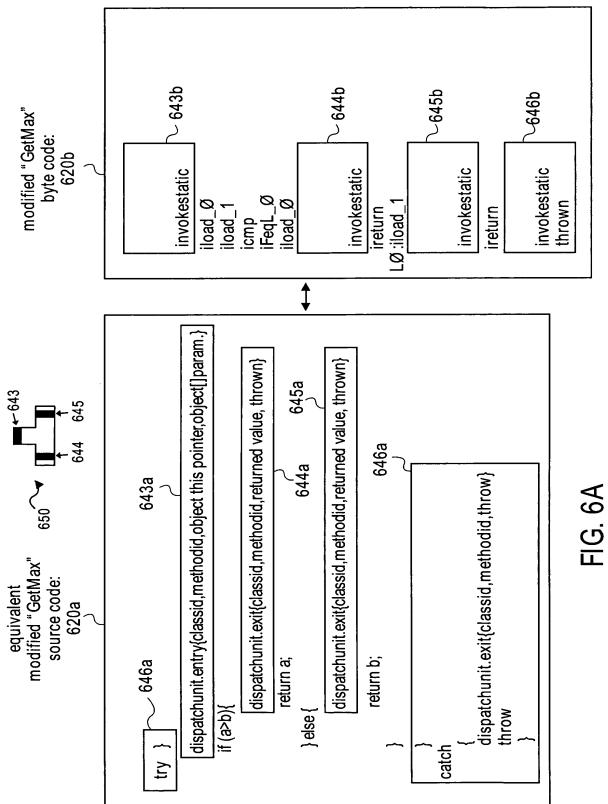


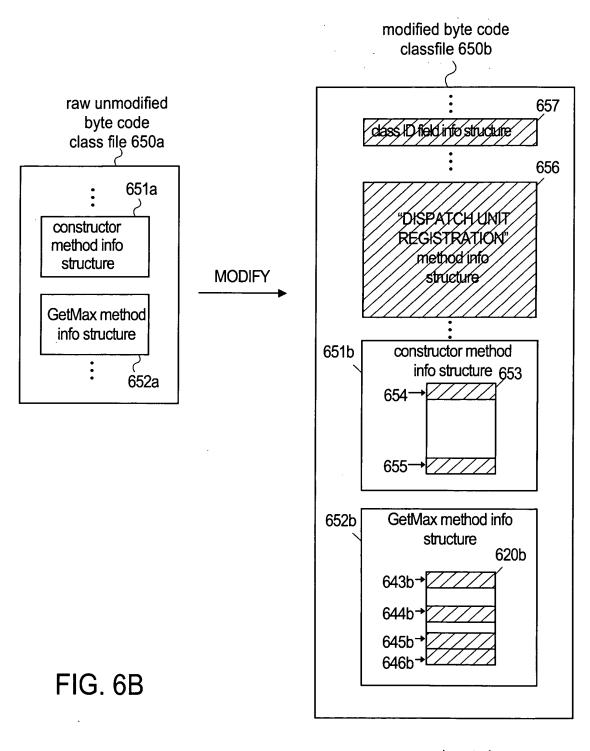
FIG. 4A











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	INVOKING METHOD	PLUG IN MODULE
(method_1)	C ₁ , M ₁ , args ₁₁	PIM_A
(method_2)	C ₁ , M ₂ , args ₁₂	PIM_A
(method_3)	C ₂ , M ₁ , args ₂₁	PIM_B
(method_4)	C ₃ , M ₁ , args ₃₁	PIM_A ·
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FIG. 7

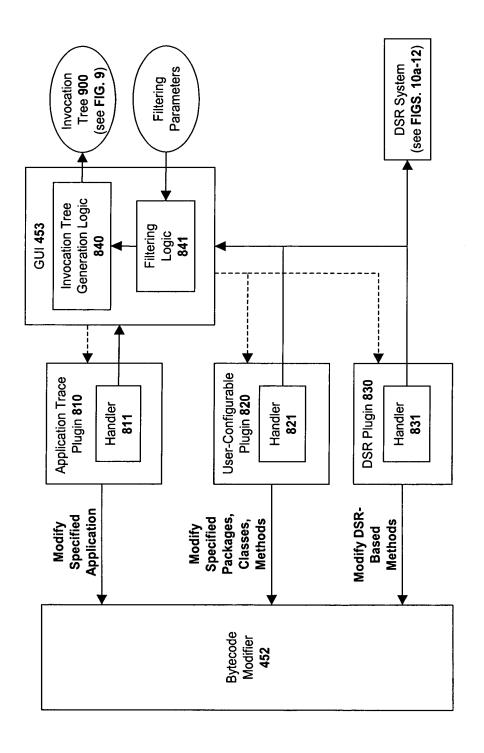
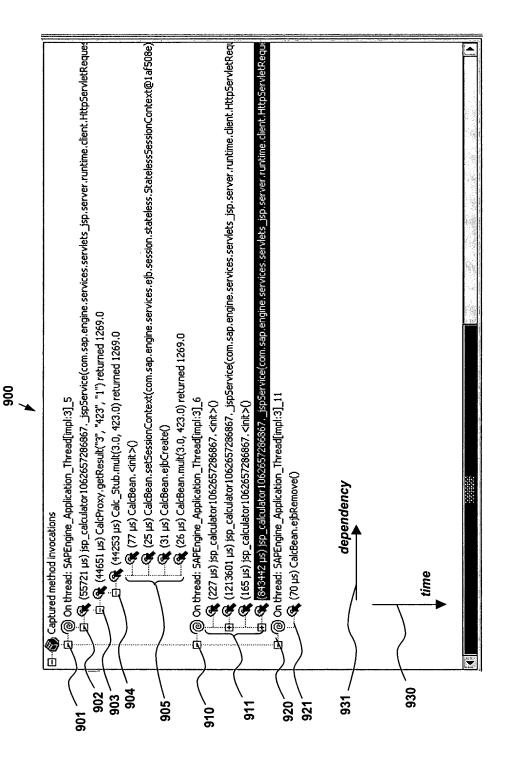


FIG. 8



Invocation Tree

FIG. 9A

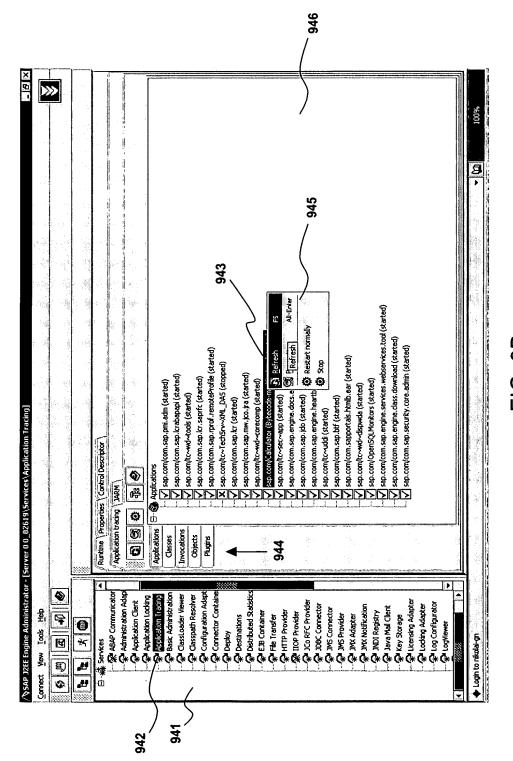


FIG. 9B

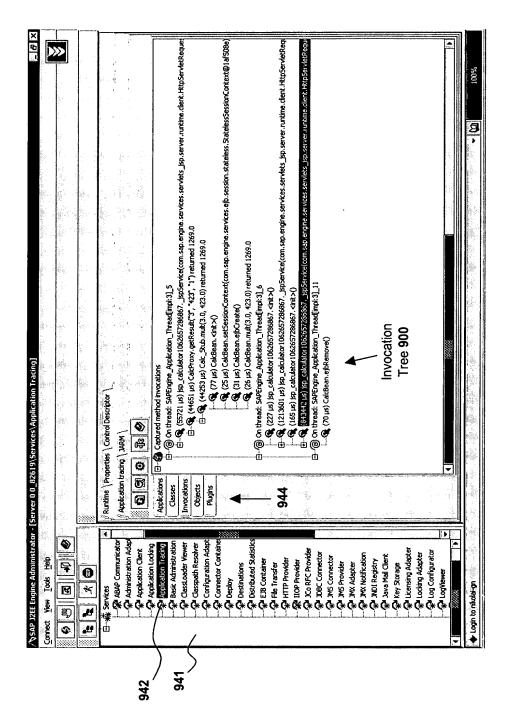


FIG. 9C

FIG. 9D

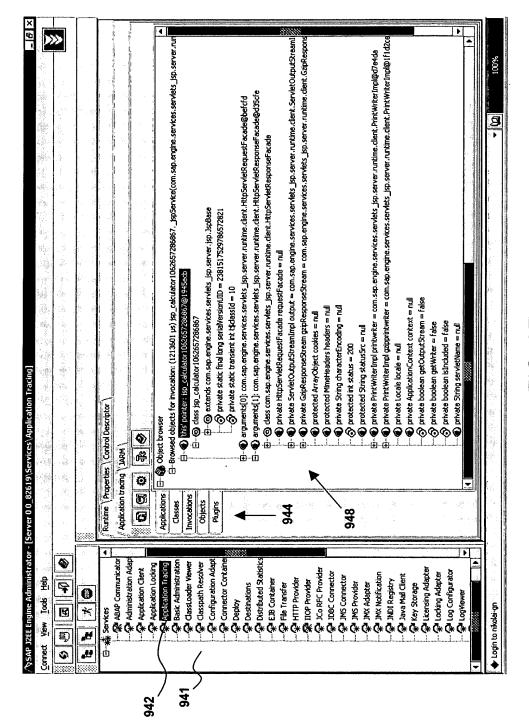
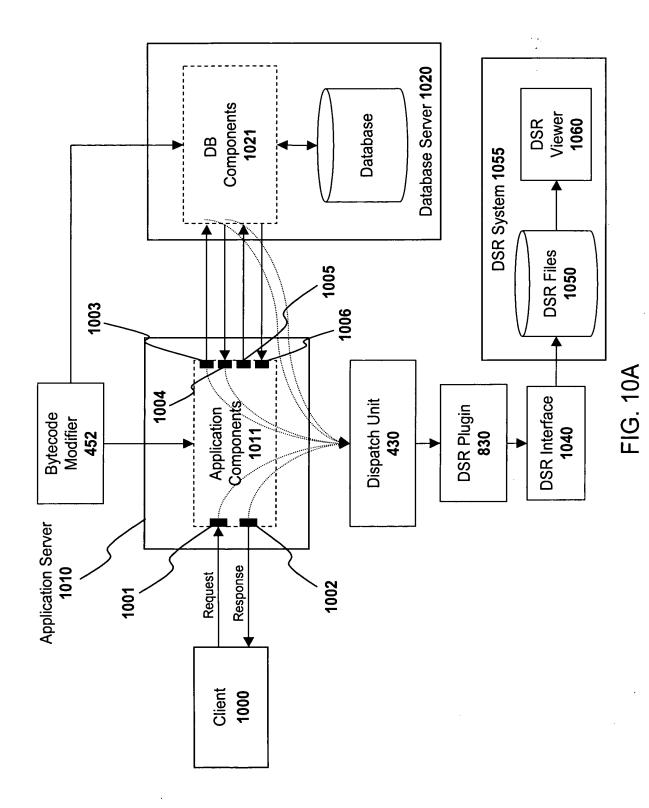


FIG. 9E



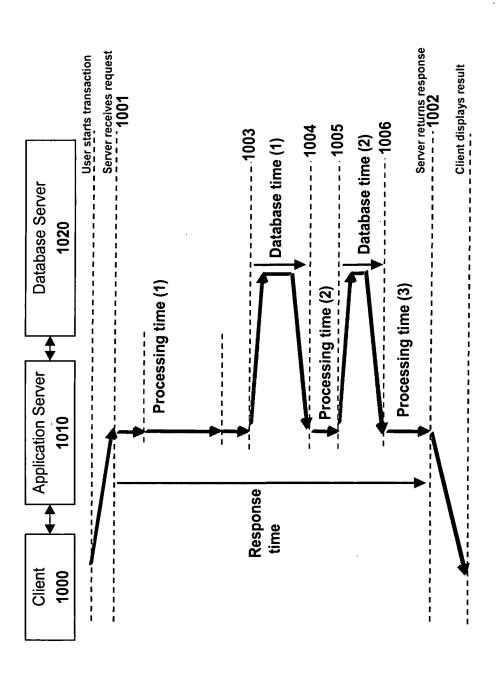
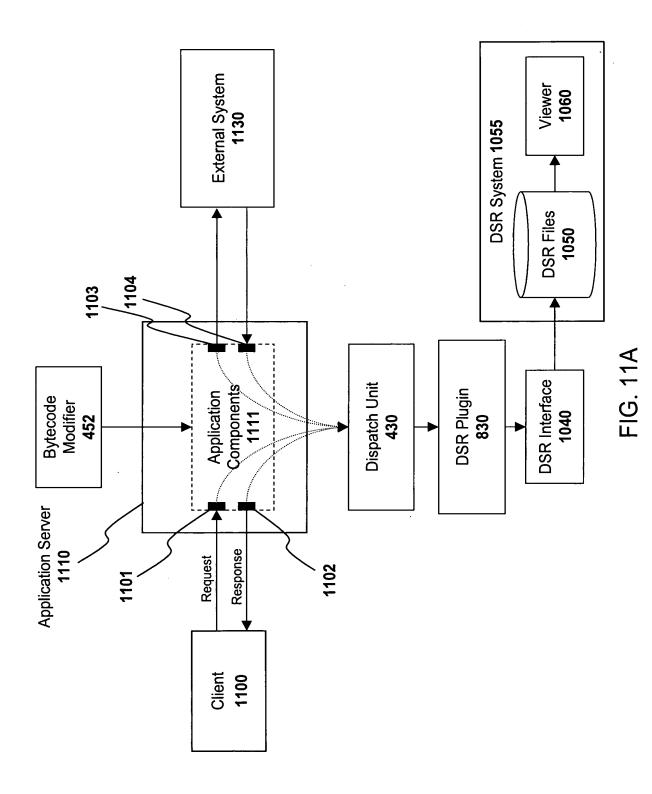


FIG. 10B



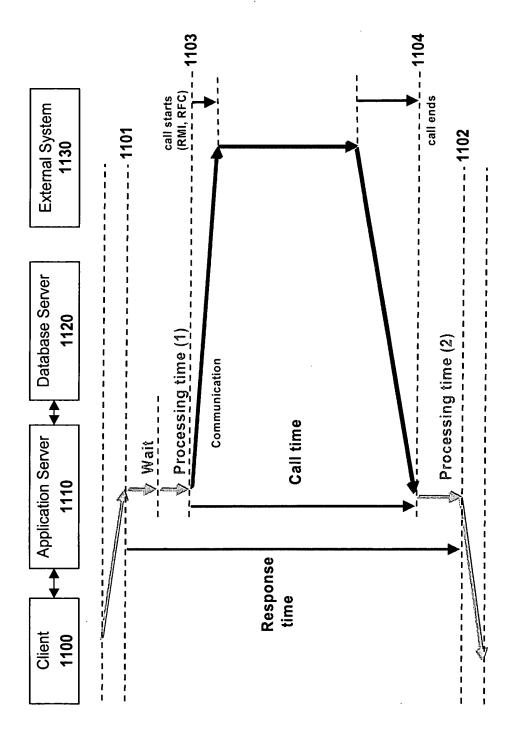


FIG. 11B

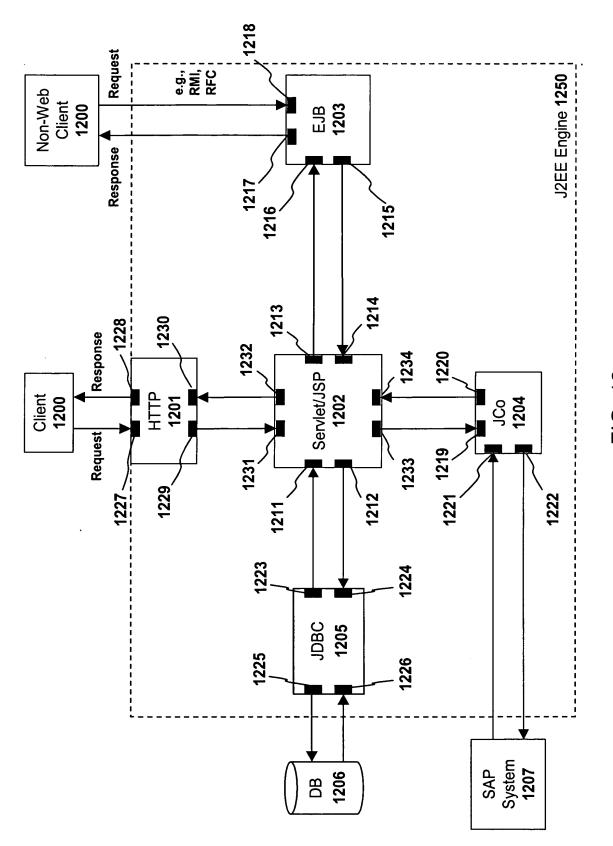


FIG. 12

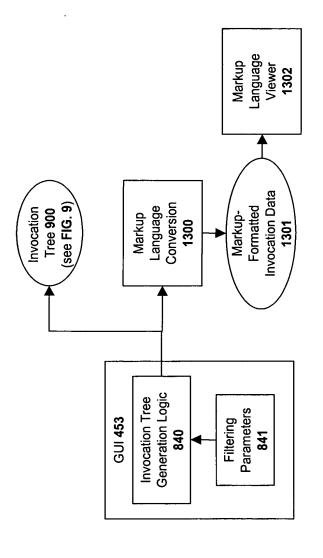


FIG. 13

FOR EACH CLASSFILE HAVING A METHOD TO BE MODIFIED:

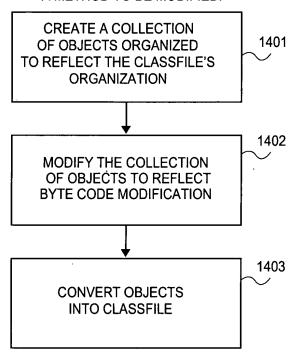
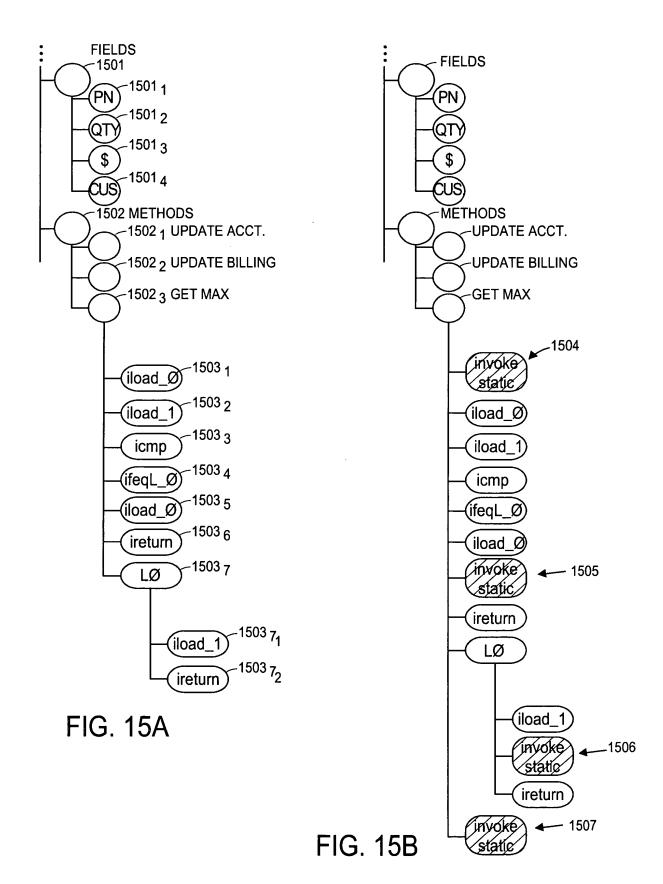


FIG. 14



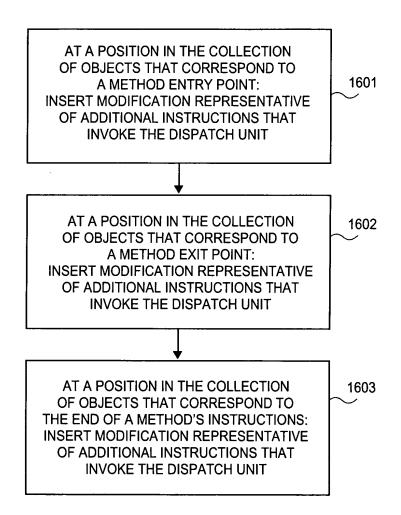
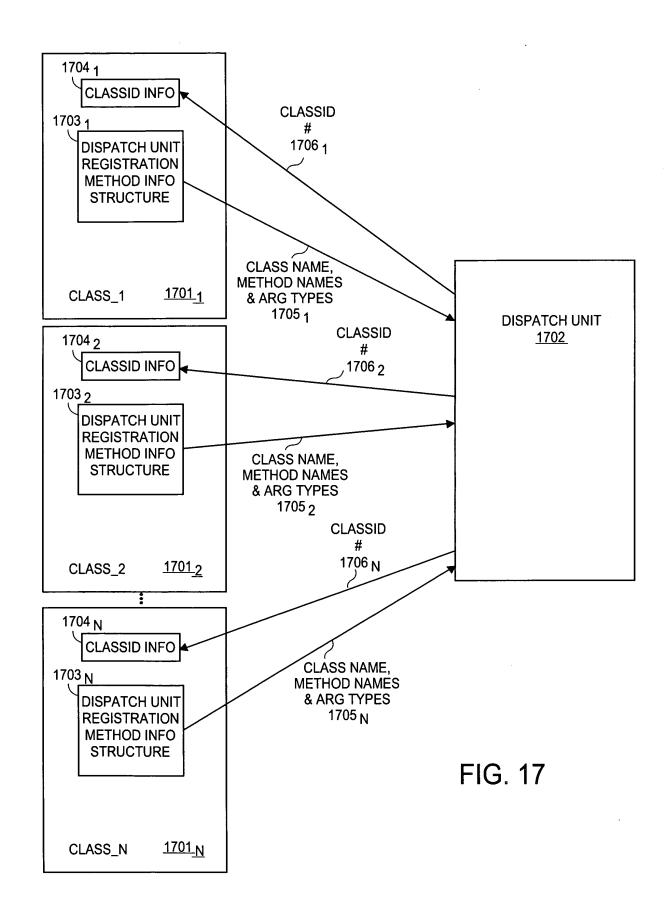


FIG. 16



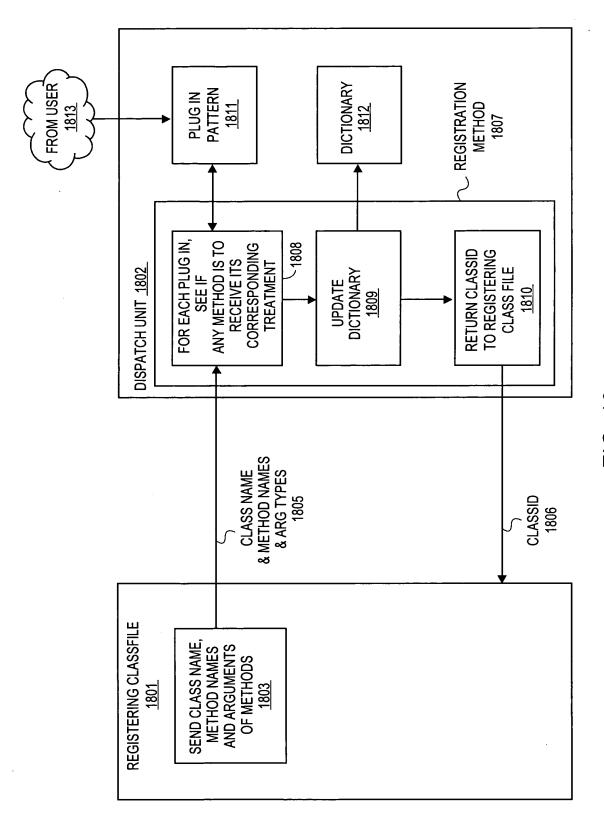


FIG. 18

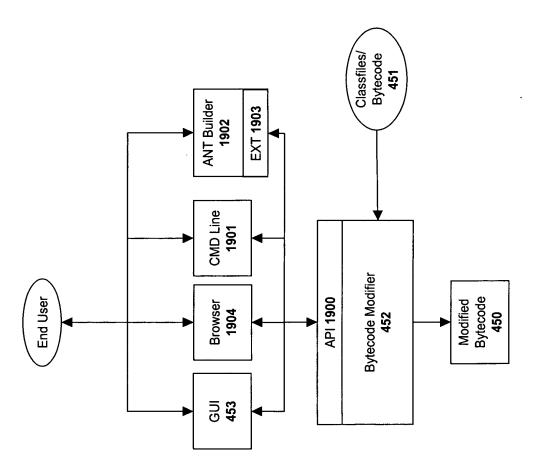


FIG. 19A

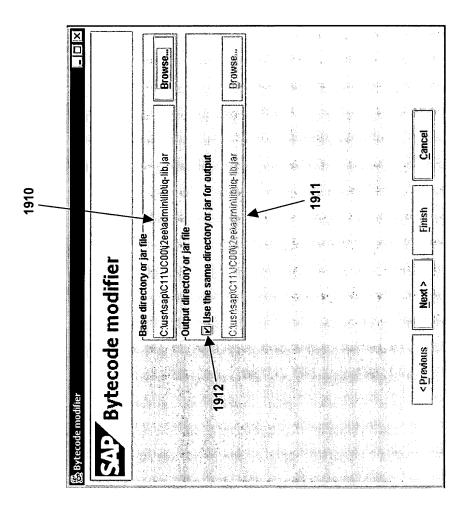


FIG. 19B

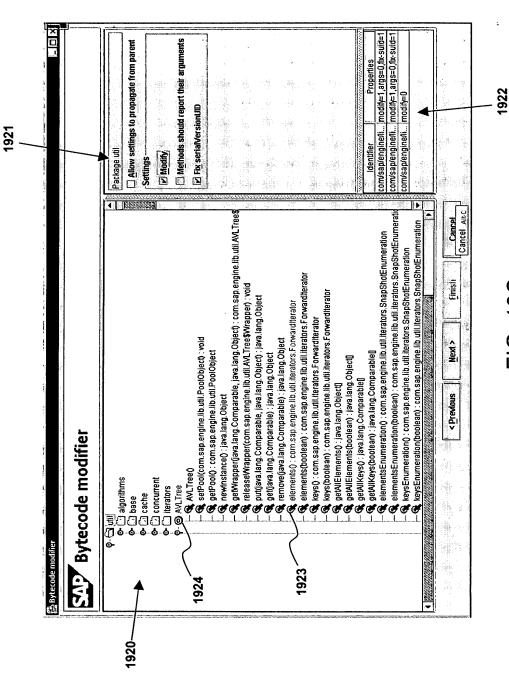


FIG. 19C

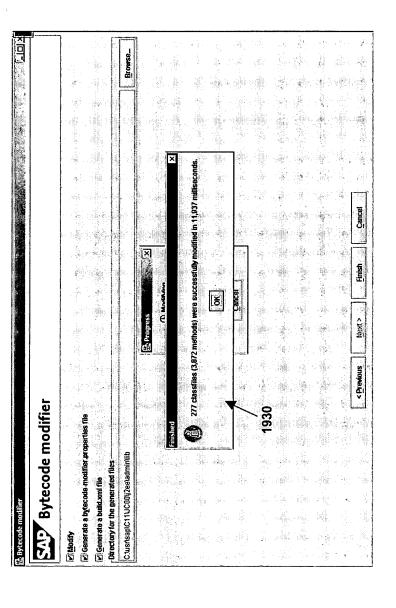
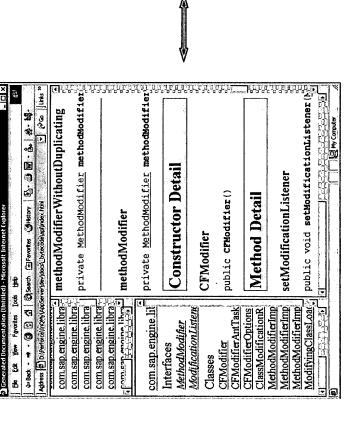


FIG. 19D



// Direct modification of a file
CFModifier modifier = new CFModifier();
modifier.modify("D:/temp/A.class", null);

// Modification in a classloader
Class defineModifiedClass(byte[] data) {
 CFModifier modifier = new CFModifier();
 byte[] datal = modifier.modify(data);
 return defineClass(datal);
}

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FIG. 19

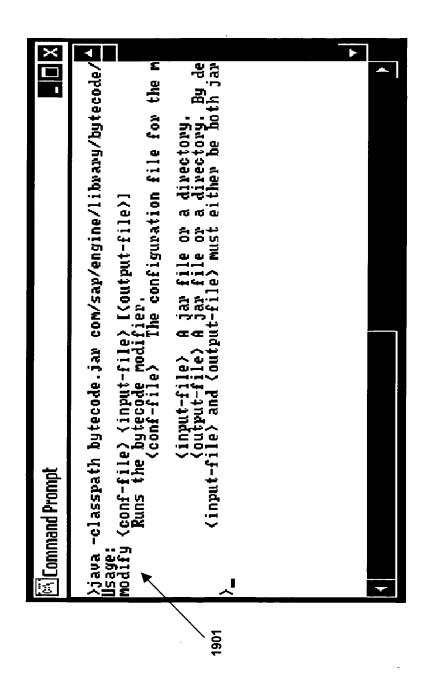


FIG. 19F

<taskdef name="modify"</pre>

classname="com.sap.engine.library.bytecode.modifier.ModifierTask"

classpath="bytecode.jar"/>

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<modify conf="bytecode-modifier.properties"</pre>

inputFile="D:\temp\classes" outputFile="D:\temp\classes1"

check="true" verbosity="2" failonerror="true"/>

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FIG. 19G